

Guide to Cost of Production Budgeting

J. Molenhuis

Factsheet

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Choosing what crops or livestock to produce is an essential decision of any farm business. One critical factor in making that decision is the cost of producing the "enterprises" being considered. This is known as enterprise budgeting or cost of production budgeting. Enterprises are a single crop or livestock commodity that produces a marketable product. **Cost of Production (COP) budgeting** consists of estimating the costs associated with an enterprise and the expected revenue. This Factsheet outlines the process and use of COP budgeting for farm-level decision-making.

WHAT IS A COP BUDGET

While the format of COP budgets can vary they typically include the following sections.

- **Revenue:** the gross revenue from crop or livestock sales before any expenses have been deducted.
- **Direct Variable Costs:** expenses for the production of a specific commodity. These change depending on the level of production (i.e., seed, fertilizer, pesticides and feed).
- **Indirect Variable Costs:** expenses used in producing all commodities on the farm (i.e., fuel, labour and utilities). These also change depending on the level of production.
- **Fixed Costs:** expenses that remain the same regardless of the level of production (i.e., property taxes, fire insurance and depreciation).
- **Net Profit (loss):** revenue minus all variable and fixed costs.

HOW TO USE YOUR COP

Knowing your cost of production is vital for making farm level decisions.

Enterprise mix decisions

If possible, review your cost of production for each individual enterprise for the past three to five years. This shows how much each is contributing to the whole farm financial picture, illustrating which enterprise is making money and which is not.

Purchasing and marketing decisions

Pricing targets for inputs and outputs can be set at different cost breakeven levels. Know your breakeven points. This information allows you to take advantage of buying or selling opportunities when they arise. Use the following formulas to determine breakeven points.

Breakeven price to cover variable costs

$$\frac{\text{Total variable costs}}{\text{Expected yield}} = \$ / \text{unit produced}$$

This is the minimum price needed to cover variable costs.

Breakeven price to cover total costs

$$\frac{\text{Total costs}}{\text{Expected yield}} = \$ / \text{unit produced}$$

This is the minimum price needed to cover all costs.

Breakeven yield

$$\frac{\text{Total costs}}{\text{Expected price}} = \text{Unit produced}$$

This is the minimum yield needed to cover all costs.

Investment decisions

Making the right investments in capital assets like land, machinery and buildings is critical to long-term success. COP information shows what the farm can afford to pay for those assets. Review investments in enterprises that fail to meet total costs in the long run, and redirect resources to more profitable enterprises.

PREPARING A COP BUDGET

Good cost of production information starts with good farm records. If your current recordkeeping system does allow estimating costs on an enterprise level, change it. Many paper based record books, including Publication 540, *Ontario Farm Record Book*, provide space to record income and expenses by enterprise. Farm accounting software makes it easier to track this level of information.

Historical Estimates versus Projections

Budgeting estimates use either historical estimates or projections. Historical estimates use actual farm results and provide a measure of past enterprise performance. Projections are estimates for a future period.

Unit Produced versus Production Unit

There are two units of measurement to base costs on in preparing a budget – unit produced or production unit.

- Unit produced is the output or yield that the commodity is commonly measured by, for example bushels of corn, market hogs sold or tonnes of grapes.
- Production unit is the base unit used to produce the output or yield such as a hectare of land, square foot of greenhouse space, sow, cow or ewe.

Since the production unit remains fairly constant throughout production, budgets are usually prepared on a production unit basis.

First calculate the dollar per production unit; then test this with different yield levels to calculate your dollar per unit-produced costs.

Estimating Enterprise Revenue

Historical estimates use the average price received multiplied by the average yield to arrive at enterprise revenue.

Projections can use average historical price/yield or expected price/yield, depending on the purpose of the budget. To obtain a good planning estimate, use:

- the past five-year average for prices and yields, or
- a season-adjusted market price for the month of the expected time of sale.

Example

Average vidal grape yield per hectare \times Average market price = Vidal enterprise revenue

$$\begin{aligned}17.5 \text{ tonnes per hectare} \times \$555.00 \text{ per tonne} \\= \$9,712.50 \text{ per hectare}\end{aligned}$$

Estimating Enterprise Costs

The difficulty many farmers have in COP budgeting is allocating costs to the specific enterprise. And the more enterprises there are, the more difficult the allocation process.

First identify your enterprises. Include them all, even those used by other enterprises, such as hay fed to livestock. (Calculate the home-grown feed enterprise costs to determine if it is cheaper to grow feed on the farm or to purchase it from off-farm sources.)

Assign costs to the individual enterprises. The American Agricultural Economics Association (AAEA) has guidelines for COP budgeting available in their publication *Commodity Cost and Returns Estimation Handbook*. This handbook is available at the United States Department of Agriculture's Natural Resources Conservation Service website at: www.economics.nrcs.usda.gov/care/aaea/index.html

Then, use the three main approaches to estimating enterprise costs: using on farm records, market value information and formula based.

1. Using on farm records

The on farm records approach can be further broken down into direct costing and allocating whole farm expenses.

Direct Costing

Direct costing uses the actual amount paid for each cost item by enterprise. This requires commodity-specific records. Direct costing is the preferred cost estimation method for direct variable costs because it uses actual prices and quantities, providing the best estimate of your farm's COP.

Allocating whole-farm expenses

Allocating whole-farm expenses distributes each item to a commodity according to an allocation scheme. It can be difficult to allocate whole farm expenses as they are not directly attributable to a single enterprise, but all enterprises share the cost.

Whole farm expenses include items such as:

- advertising
- utilities
- memberships/subscription fees
- office expenses
- professional fees
- motor vehicle expenses
- small tools
- property taxes
- fire and liability insurance premiums.

You must allocate whole farm expenses to arrive at a total cost of production for an enterprise. But this should have no effect on enterprise selection decisions. Your enterprise choices should be the same after allocating whole farm expenses as it was before they were added.

Common allocation methods

of whole farm expenses:

- Per cent of enterprise gross margin (see *Interpreting a COP Budget* for information on gross margin)
 - This is the recommended method. For example, if a commodity accounts for 30 per cent of the whole farm gross margin, the commodity is charged 30 per cent of the overhead costs. Use one of the other methods below if there are objective reasons to do so.
- Percent of sales — expenses are allocated according to how much the enterprise contributes to the gross sales
- Percent of total expenses — expenses are allocated according to how much the enterprise contributes to the whole farm expenses
- Number of Hectare (Acre)-trips — i.e. no-till field operations require less machinery passes so the machinery cost is less than conventional tillage
- Hours spent — allocating labour costs across the enterprises. If machinery hours are tracked by enterprise this can be effective way to allocate these costs
- Self defined — based on experience and unique to site or farm

No one allocation method is right for every farm business or every enterprise or for all expenses; it may take a variety of methods. Use the method that makes the most sense for your farm and each expense.

Once allocations are developed and, provided there are no significant changes to the enterprise mix, keep them consistent. This will make for better year-to-year comparisons.

2. Market Value

Market value uses current market prices to determine the cost estimate. This is commonly used for costs such as land, labour and machinery.

The preferred estimate for land costs is the cash rental rate, since cash rental rates are assumed to cover all costs associated with owning agricultural land.

Labour requirements on the farm can be supplied by a combination of paid and unpaid labour. To estimate costs for all labour multiply the total number of hours needed (paid and unpaid) in an enterprise by the current hourly wage rate.

Machinery costs can be difficult to estimate on an enterprise level. A common approach is to use the custom farmwork rates for the operations involved in the enterprise to arrive at the enterprise machinery cost.

The downside to using market values is they may not accurately reflect what is happening on your farm. There can be large differences between market prices and your own costs. Use your records to provide the most accurate measure of costs.

3. Formula based

A formula-based approach is particularly useful for estimating capital costs associated with farm machinery and buildings. This method takes fuel use and repair rates, replacement costs and years of expected life to insert into formulas that calculate annual variable and fixed costs.

See OMAFRA Factsheets *Budgeting Farm Machinery Costs*, Order Number 01-075 and *Lease Agreements for Farm Buildings*, Order Number 03-095, for detailed information and tables to calculate machinery and building costs using the formula-based approach.

Estimation approaches summary

There is nothing wrong with using different methods for different individual costs. Table 1, *Recommended Estimation Approaches by Enterprise Expense*, presents AAEA's recommended methods on an individual cost basis. If information is not available for the recommended estimation method, choose another method where information is available. Remember that it is better to use your own commodity specific information as this will provide the best estimate of your farm's COP.

OTHER COST CONSIDERATIONS

Establishment costs – Perennial crops only produce after an “establishment” period. The costs associated with this non-productive time need to be recovered during the crops productive life. Include an estimate of the annual cost to recover establishment costs in the annual budget of the years in full production. Spread these costs over the expected productive life of the crop.

Depreciation is a non-cash cost that measures the loss of value of machinery or buildings over time. It is the portion of the cost of the machinery or building that is counted as an expense each year. Costs are spread over their expected useful life. The depreciation rate used for tax purposes typically does not reflect the expected useful life of the asset. A rate that better reflects the life of the asset is more appropriate for business management purposes.

Interest

Interest paid on loans is the actual cash paid in interest for existing loans. This gives a good estimate for cash flow purposes but fails to account for the cost of having your money invested in the operation.

Interest on investment represents the cost of money tied up in purchasing assets or operating inputs whether the money is borrowed or your own. This is also referred to as the opportunity cost; it is what you could have earned with that money if you had invested it in the next best alternative. The interest rate used should reflect conservative rates of return for money that could be obtained in the current market, e.g. GIC rate, T-Bill rate or the current lending rate for operating credit. This assigns an interest cost to your investments regardless of whether the money is borrowed or not.

Table 1. Recommended Estimation Approaches by Enterprise Expense

Estimation Approach			
Direct	Allocate Whole Farm Expenses	Market Value	Formula-based
Commodity purchases (seed, livestock, feed grain)	Motor vehicle expenses	Labour	Machinery (gasoline, diesel, fuel, oil)
Fertilizers and soil supplements	Small tools	Agricultural Contract work	Machinery (repairs, licenses, insurance)
Pesticides and chemical treatments	Containers and twine	Freight and shipping	Building and fence repairs
Prepared feed, minerals and salts	Soil testing	Commissions and levies	Depreciation (buildings and machinery)
Custom feeding	Office expenses/legal and accounting fees	Storage/drying	Interest (operating)
Veterinary fees, medicine, breeding fees	Advertising and promotion costs	Rent (land, buildings, pastures)	Interest (real estate, mortgage, term loans)
Insurance premiums (crop or production)	Memberships/subscriptions/licenses/permits	Machinery lease/rental	
Other crop and livestock supplies	Motor vehicle interest and leasing costs		
	Utilities (electricity, telephone, heating fuel)		
	Other insurance premiums		
	Property taxes		

Land costs are a good example. If there is no land debt there are no cash interest costs; but there is a cost associated with having money invested in land and not available for other uses. Use the formula-based method to calculate interest on investment.

Example

$$\text{Interest on investment costs} = \\ \text{Land value} \times \text{interest on investment rate}$$

Land value — Land is valued at its current fair-market value for agricultural purposes. (e.g. \$1,400/hectare)

Interest on investment rate — use conservative, current market investment rates e.g. GIC, T-bill rate (e.g. 3.5%)

$$\text{Interest on investment on land} = \\ \text{Land value} \times \text{interest rate} = \$1,400 \times 3.5\% \\ = \$49.00 \text{ per hectare}$$

The OMAFRA Factsheet *Cash Lease Agreements for Cropland*, Order Number 01-071, discusses in detail the process outlined above for calculating land costs.

Livestock Replacement and Death Loss Costs

Whether raised on the farm or purchased, factor in the cost to replace livestock. Market value is typically used to estimate these costs. Replacement cost is the net value between the estimated market value of replacements and the estimated cull value multiplied by the replacement rate. The replacement rate incorporates a cull rate and a death loss rate.

Example

Sow replacement cost

$$\begin{array}{ll} \text{Replacement rate} & = 35\% \\ \text{Death loss rate} & = 5\% \end{array}$$

Replacement value

$$= 300.00$$

Cull value

$$= \underline{\underline{(150.00)}}$$

Net value

$$= 150.00$$

Replacement cost =

$$\begin{array}{l} \text{Net value} \times (\text{replacement rate} + \text{death loss rate}) = \\ \$150 \times 40\% = \$60.00 \end{array}$$

Not all animals being raised for sale make it there, so consider death loss in your market livestock. Use a reasonable death rate to reduce the number of expected market livestock. Then the market livestock bears the cost that went into the livestock that died along the way.

INTERPRETING A COP BUDGET

Your COP budget measures three different margins:

- contribution margin
- gross margin
- profit margin.

Start with the contribution margin, then move to the gross margin and end with the profit margin. Each margin provides information to make farm level decisions. Appendix 1, *Farm Enterprise Allocation Record*, will help you through this process.

Contribution Margin

Contribution margin is revenue minus direct variable costs or production related costs. For crops this includes seed, fertilizer, pesticides, crop insurance and marketing. For livestock this includes feed, livestock purchases, custom feeding, health, breeding and marketing. This is the simplest margin to calculate since you are dealing with costs directly related to growing crops or raising livestock.

If the contribution margin is negative at this point, think seriously about whether this will ever be a profitable enterprise. Costs would need to be significantly reduced or revenue significantly increased to make it worthwhile — and there are still many costs that have not yet been included.

Use contribution margin as a quick reference point in making short term cropping decisions. If a new crop does not require additional labour or machinery, the direct variable costs of your crop choices will change the most from one crop to the next. The contribution margin tells you whether the enterprise is contributing to the other indirect costs and by how much compared to other enterprises.

Gross Margin

Gross margin is revenue minus all variable costs. This involves allocating whole farm costs that all enterprises must share. Use the gross margin to decide if it makes sense to invest in capital assets for this enterprise. Capital assets are long-term assets with a useful life longer than a year. These include land, buildings, machinery and quota.

If the gross margin is negative, determine if anything can be realistically done on the cost or revenue side to turn this into a positive. A positive number indicates that the enterprise does contribute to paying some or all of its fixed farm costs.

If, for example, the enterprise covers all variable costs and only a portion of fixed costs, you could continue with the enterprise in the short run, while looking at either cost reductions or revenue increases to have it cover all costs in the future.

Profit Margin

Profit margin is revenue minus all variable and fixed costs. Without long-term profit, a farm business is not sustainable. Sustainability depends on every enterprise covering all costs and providing a return to management.

RISK AND THE COP BUDGET

Farming is a risky business and profit is a return to risk. To make a profit, you must take risk. The goal is to learn to manage it. It is necessary to develop reasonable expected yield, cost and price estimates in decision making. However, expected outcomes are not enough for effective decision making. A producer must also consider the consequences of outcomes other than those expected or are considered most likely. Think of these other outcomes as the 'what ifs' of decision making. What if weather is less favourable than expected? What if market prices are lower than expected? What if insects or disease reduce yields or increase death losses for livestock? What if a crop is wiped out by hail or flood?

Since a wide variety of 'what ifs' can affect yield, price and cost, it is highly unlikely that actual net returns will match your estimated net returns. Understanding and anticipating these unpredictable risks, is critical to budgeting.

The Budgeting Tools of the Ontario Enterprise Budgets on OMAFRA's Agriculture Business Management website (www.ontario.ca/agbusiness, select *Cost of Production Budgets*) allow you to assess the potential impact of production and marketing risk factors and risk management strategies. In each commodity budget expected as well as optimistic and pessimistic outcomes for key risk variables are submitted. Based on these entries the tool then calculates an assessment of how much risk is involved in this enterprise.

SUMMARY

Cost of production information is an essential ingredient for farm level decision making. Knowing your cost of production is the first step in controlling them. Good cost of production information starts with good farm records. If your current recordkeeping system does not lend itself to estimating your costs on an enterprise level, start making changes today.

REFERENCES

Commodity Costs and Returns Estimation Handbook,
American Agricultural Economics Association,
February 2000

Budgeting Farm Machinery Costs, Order No. 01-075

Lease Agreements for Farm Buildings, Order No. 03-095

Cash Lease Agreements for Cropland, Order No. 01-071

Other OMAFRA Business Resources

Field Crop Budgets (annual) –
Publication 60, Order No. 0060E

Establishment and Production Costs for Grapes in Ontario
– 2005 Economic Report

Establishment and Production Costs for Tender Fruit in Ontario – 2006 Economic Report

Guide to Custom Farmwork and Short-Term Equipment Rental, Order No. 07-019

Leasing Farm Equipment, Order No. 01-003

Diagnosing and Managing Cash Flow Problems, Order No. 06-085

Land Lease Arrangements, Order No. 01-065

Crop Share Lease Agreements, Order No. 01-067

Flexible Cash Lease Agreements, Order No. 01-069

Evaluating the Feasibility of Business Opportunities,
Order No. 03-051

Ontario Farm Record Book,
Publication 540, Order No. 0540E

*Programs and Services for Ontario Farmers,
Order No. 08-037*

Farm Business Insurance, Order No. 00-041

Internet Resources

Ontario Enterprise Budgets – OMAFRA Business Management. Enterprise budgets for crop and livestock enterprises in Ontario available in Excel and HTML format www.omafra.gov.on.ca/english/busdev/bear2000/Budgets/oeb.htm

Canadian Farm Budget Database – Canadian Farm Business Management Council. This database includes 1,500 budgets and financial data pages from across Canada
www.farmcentre.com/farmbudget/Default.aspx

Budget Library – University of Minnesota (English only). The Budget Library includes current enterprise budget information and software from throughout the United States www.agrisk.umn.edu/Budgets/

This Factsheet was written by John Molenhuis, Business Analysis and Cost of Production Program Lead, Brighton, OMAFRA.

Appendix 1. Farm Enterprise Allocation Record

Farm Name:		Allocations: Year 20 (use \$ or %)		
	Whole Farm	Enterprise Name	Enterprise Name	Enterprise Name
REVENUE				
Commodity sales	\$			
Program Payments	\$			
Other farming revenue	\$			
Total Revenue:	\$			
EXPENSES — VARIABLE				
Direct (production) expenses				
Commodity purchases (seed, livestock, feed grain)	\$			
Fertilizers and soil supplements	\$			
Pesticides and chemical treatments	\$			
Prepared feed, minerals and salts	\$			
Custom feeding	\$			
Vet fees, medicine, AI fees	\$			
Insurance premiums (crop or production)	\$			
Other crop and livestock supplies	\$			
Total direct (production) expenses	\$			
Contribution margin (Revenue minus direct expenses)	\$			
Indirect variable expenses				
Labour	\$			
Agricultural Contract work	\$			
Freight and shipping	\$			
Commissions and levies	\$			
Machinery (gasoline, diesel, fuel, oil)	\$			
Machinery (repairs, licenses, insurance)	\$			
Motor vehicles expenses	\$			
Small tools	\$			
Containers and twine	\$			
Soil testing	\$			
Building and fence repairs	\$			
Utilities (electricity, telephone, heating fuel)	\$			
Storage/drying	\$			
Office expenses/legal and accounting fees	\$			
Advertising and promotion costs	\$			
Memberships/subscriptions/licenses/permits	\$			
Interest (operating)	\$			
Total Variable Expenses (direct plus indirect)	\$			
Gross Margin (Total revenue minus variable expenses)	\$			
EXPENSES — FIXED				
Property taxes	\$			
Rent (land, buildings, pastures)	\$			
Interest (real estate, mortgage, term loans)	\$			
Machinery lease/rental	\$			
Motor vehicle interest and leasing costs	\$			
Depreciation (buildings and machinery)	\$			
Other insurance premiums	\$			
Other (specify):	\$			
Total Fixed Expenses	\$			
Total Expenses (Variable plus Fixed)	\$			
PROFIT (LOSS) MARGIN (Revenue minus Total expenses)	\$			

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Depreciation (buildings and machinery)	\$			
Other insurance premiums	\$			
Other (specify):	\$			
Total Fixed Expenses	\$			
Total Expenses (Variable plus Fixed)	\$			
PROFIT (LOSS) MARGIN (Revenue minus Total expenses)	\$			

FOR YOUR NOTES

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Agricultural Information Contact Centre:
1-877-424-1300
E-mail: ag.info.omafra@ontario.ca
Northern Ontario Regional Office:
1-800-461-6132

www.ontario.ca/omafra



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